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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/800,717	03/16/2004	Takeshi Kijima	119113	1032

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EXAMINER	
MILLER, MICHAEL G	
ART UNIT	PAPER NUMBER
1792	

MAIL DATE	DELIVERY MODE
03/04/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/800,717	KIJIMA ET AL.	
	Examiner	Art Unit	
	MICHAEL G. MILLER	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 February 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2 and 4-9* is/are pending in the application.

4a) Of the above claim(s) *7 and 8* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4-6 and 9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 17 FEB 2009 has been entered.

Response to Amendment

2. Examiner notes the amendment filed 17 FEB 2009. The amendment introduces no new matter and is therefore accepted. As a result of the amendment Claim 1 is amended. As a result of the amendment, the rejection of Claims 1-2, 4-6 and 9 are withdrawn as the references do not fairly teach a heat source provided outside the chamber.

Response to Arguments

3. Applicant's argument filed 17 FEB 2009 has been fully considered but is ultimately moot.

4. Applicant's first argument is that it cannot be conclusively shown that the heater is on the chamber. Applicant notes that the amendment renders this argument moot, Examiner agrees.

5. Applicant's argument filed 17 FEB 2009 have been fully considered but they are not persuasive.

6. Applicant's second argument is that the references do not clearly teach that the capacity of the chamber is less than 100 times the volume of a substrate and argues that the drawings are meant to indicate special relationships instead of relative sizes. Examiner points out that the justification for the rejection included acknowledgement of the fact that reactor size and control thereof are well known variables for optimization in process design. Further, Examiner notes that if the references were interested in having a vastly disproportionate chamber:wafer volume ratio, this would qualify as a special relationship and would have been noted in the drawings (as mentioned above, it is known in process design to minimize the size of a reactor for a given task).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1 – 2, 6 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Natori, et al. (United States Patent Application Publication US 2003/0020157 A1, hereafter Natori) in view of Maloney (U.S. Patent 6,365,236, hereinafter Maloney) and Wu (United States Patent 6,393,210 B1).

9. Regarding Claim 1, Natori teaches a method of manufacturing a ceramic film (see Paragraphs [0005] – [0009]), comprising: providing a treatment target in which a raw material body including a complex oxide is applied to a substrate (see, e.g., Paragraphs [0061] – [0070], Paragraphs [0281] – [0283] and [0328] – [0330],

Paragraphs [0336] – [0339], and Claims 15, 16, and 17); holding the treatment target in a chamber (PG 0272-0275); supplying a gas which includes at least an oxidizing gas to the chamber (PG 0272-0275); and crystallizing the raw material body by increasing pressure of the gas in the chamber to a predetermined pressure of two atmospheres or more and heating the treatment target to a second temperature in the chamber by a heat treatment (see, e.g., Paragraphs [0272], [0273], and especially [0275]).

10. Natori does not explicitly teach that the heat source is outside the chamber. Maloney teaches a method for forming a multi-layered ceramic stack with different porosities between the layers and notes that for providing heat to the substrate, external heaters may be used (Column 5 Lines 10-47, most notably Lines 33-37). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to have combined the methods of Natori and Wu, as Natori wants to form ceramic films on substrates and Wu teaches a method for doing so wherein the substrate is heated by external sources.

11. Natori/Maloney does not explicitly teach the method of wherein the gas is supplied to the chamber after being heated to a first temperature in advance. However, Wu teaches just such a limitation in the heat treatment of semiconductor substrates. Specifically, Wu teaches, in Column 5, lines 7 – 20, that “the method and apparatus of this invention can be used in many different heat treatment applications in which a gas composition is employed to flow through the object being treated ... The method can … be used in the thermal annealing of ion or dopant implanted semiconductor wafer, sintering metal contacts to enhance the metal-semiconductor contact after the

deposition of metal film, … and the like." Wu further teaches, in Column 6, lines 25 – 46, that "the preheat unit preheats a gas composition used in the thermal processing of a wafer in the reactor. Gas compositions useful in the thermal processing of wafers are generally known in the art … In a rapid thermal oxidation process, a gas composition having oxygen optionally in admixture with an inert gas is used." Wu also teaches, in Column 3, lines 9 – 31, that "in accordance with the present invention, the gas composition is preheated before it is flushed into the rapid thermal processing chamber. Typically, the gas composition is heated to a preheat temperature that is sufficiently close to the operating temperature of the thermal processing chamber such that when the gas composition reaches the wafer being treated, its temperature is substantially same as the operating temperature. Preferably, the gas composition is preheated to the operating temperature before it flows into the processing chamber. Because the difference between the entering gas temperature and the operating temperature in a processing chamber is drastically reduced or even eliminated, when the gas composition flows into the processing chamber, it will not absorb any substantial amount of heat from the outer edge of the wafer being processed. Thus, the interference with the temperature uniformity on the wafer surface by the entering gas composition is minimized." Finally, Wu teaches, in Column 4, lines 9 – 13, that "by preheating the gas composition, the present invention significantly reduces the temperature difference, and improves the temperature uniformity on the wafer surface. As a result, less dislocation and distortion in the processed wafer is caused, and wafers with better qualities can be produced." Therefore, it would have been obvious to one

having ordinary skill in the art at the time of the present invention to have modified the method taught by Natori by supplying the oxygen-containing sintering/annealing gas to the crystallizing/heat treatment chamber heated to the pre-determined process temperature in advance as taught by Wu, because Wu teaches that utilizing such a procedure results in improved temperature uniformity across the substrate and results in wafers/substrates with improved performance.

12. Natori/Maloney/Wu does not explicitly teach the method wherein a capacity of the chamber is 100 times or less of a volume of the substrate. However, both Natori (in Figure 22) and especially Wu (in Figures 1 and 2) show reactor chambers that are obviously less than 100 times the volume of the substrate. While these drawings are not necessarily to scale, it is the Examiner's position that the scales employed in these Figures would have reasonably indicated to one having ordinary skill in the art that reactors with volumes on the same order of magnitude as the volume of the wafer are typically employed. Moreover, Wu explicitly teaches, in Column 5, lines 28 – 30, that "conventional RTP reactors which generally process only one wafer at a time can be used." Therefore, it would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Natori in view of Wu by utilizing a chamber having a capacity that is less than 100 times a volume of the substrate, because both Natori and Wu teach that such reactor sizes are typically employed in the art, and because reactor size is a known variable in process design and because minimizing process costs and reactor size are well known objectives of process design.

13. Regarding Claim 2, Natori teaches that the heat treatment is performed by using a rapid thermal annealing method (see Paragraphs [0342] and [0374]). In the alternative, Natori/Maloney/Wu does not explicitly teach that the rapid thermal annealing takes place at pressures of two atmospheres or more. However, it would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Natori by utilizing a heat treatment that is performed by using a rapid thermal annealing method in a gas which is pressurized at two atmospheres or more with a reasonable expectation of success, because Natori teaches that the heat treatment may be an annealing method performed in a pressurized, oxidizing atmosphere of 2 atmospheres or more and that the heat treatment may be a rapid thermal annealing method performed in an oxidizing atmosphere.

14. Regarding Claim 6, Natori/Maloney/Wu does not explicitly teach the method wherein the gas is supplied to the chamber after being heated in advance to the first temperature of 200 C or less. However, Natori does teach, in Paragraphs [0336] – [0343], that substrate treatment, ceramic raw material liquid application, and solvent evaporation takes place at temperatures that are less than 200 C (e.g., 180 C for substrate surface treatment in Paragraph [0338], and 160 C for solvent evaporation in Paragraph [0340]). Natori further teaches that crystallizing heat treatment takes place after these steps. As discussed for Claim 1, Wu teaches that it is known in the art to supply fluid streams to a unit operation at the temperature at which a process is taking place in order to more fully control the reaction or process. Therefore, it would have

been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Natori/Maloney/Wu by supplying the gas at a pre-heated temperature of 200 C or less, because Wu teaches that it is known to pre-heat fluid streams to a process temperature, and because Natori teaches that the steps immediately preceding the crystallizing heat treatment occur at temperatures less than 200 C.

15. Regarding Claim 9, this claim is rejected on the same grounds as Claim 1, the range of 10 to 50 times the volume of the substrate being a subset of and therefore encompassed by the range of less than 100 times the volume of the substrate.

16. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Natori/Maloney/Wu, and further in view of Cuchiaro, et al. (United States Patent 6,225,156 B1, hereafter Cuchiaro). Natori/Maloney/Wu are cited for the same reasons discussed above, which are incorporated herein.

17. Regarding these claims, Natori teaches the concept of rapid thermal annealing (RTA) (see Paragraphs [0342] and [0374]), but does not teach the method wherein the treatment target is heated to the second temperature at a temperature rise rate of 50 C/sec or more. However, Cuchiaro teaches just such limitations, wherein “a ferroelectric coating [is] crystallized using rapid-thermal processing, sometimes referred to as rapid-thermal-annealing (RTA) in which the wafer ... [is] raised to temperature at a rate of 100 C/sec" (see Column 12, lines 29 – 32). Therefore, it would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Natori/Maloney/Wu by utilizing a heat treatment using a rapid thermal

annealing method in which the treatment target is heated from the predetermined temperature at a temperature rise rate of 50 C/sec or more as taught by Cuchiaro, because Cuchiaro teaches that it is known in the art to form ceramic films including complex oxides by performing crystallization via RTA with temperature ramp rates of 100 C/sec.

18. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Natori/Maloney/Wu, and further in view of Rubey, et al. (United States Patent 5,846,293, hereafter Rubey).

19. Regarding Claim 5, Natori/Maloney/Wu does not teach the method wherein pressure of the gas in the chamber is increased to the predetermined pressure of two atmospheres or more within 60 seconds. However, Rubey teaches that it is known in the art to achieve near instantaneous pressure changes in small reactor volumes. Rubey teaches, in Column 5, lines 27 – 45, that "After the sample has been admitted … the rapid actuation switching valve is switched to high pressure gas source such that the sample receives a substantially instantaneous step-increase in pressurization to about 8.0 absolute atmospheres. By "step-increased pressurization", it is meant that substantially instantaneous increase in pressure occurs from a low (but positive) pressure to a substantially higher pressure in a short amount of time (about 30 milliseconds)." Therefore, it would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Natori/Maloney/Wu by increasing the pressure of the gas in the chamber during heat treatment to the predetermined pressure of two atmospheres or more within 60 seconds

as taught by Rubey, because Rubey teaches that is known to achieve such pressure increases in very short times via normal process design and because it is known in the art to control pressures and to minimize processing times.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL G. MILLER whose telephone number is (571)270-1861. The examiner can normally be reached on M-F 7-4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on (571) 272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Michael G. Miller/
Examiner, Art Unit 1792

/Michael Cleveland/
Supervisory Patent Examiner, Art Unit 1792